What is claimed is:

1. A mass flow sensor for operation with a mass flow controller that includes an outlet control valve for controlling fluid flow through the controller, comprising:

a thermal mass flow sensor, including a sensor bypass, configured to sense the flow of fluid into the inlet of the controller;

a pressures sensor configured to sense the fluid pressure in the volume between the thermal mass flow sensor bypass and the control valve; and

an electronic controller configured to monitor the pressure sensed by said pressure sensor and to compensate the sensed inlet flow rate sensed by said mass flow sensor to thereby produce a compensated measure of the rate of fluid flow out of the controller.

2. The mass flow sensor of claim 1 further comprising:

a temperature sensor configured to sense the temperature of fluid within the volume between the sensor bypass and the outlet control valve and to provide a signal indicative of the sensed temperature, the electronic controller configured to employ the temperature signal in producing the compensated rate of fluid flow.

3. The mass flow sensor of claim 2, wherein the temperature sensor is configured to sense the temperature of a wall that defines a portion of the volume between the sensor bypass

and the outlet control valve and to employ this sensed temperature to produce the temperature signal.

4. The mass flow sensor of claim 3, wherein the electronic controller is configured to compute the time rate of change of pressure within the volume between the sensor bypass and the outlet control valve, and to use this time rate of change of pressure to produce the compensated measure of the rate of fluid flow out of the controller.

5. The mass flow sensor of claim 1 further comprising a display configured to display the pressure within the volume between the sensor bypass and the outlet control valve.

6. The mass flow sensor of claim 4 wherein the electronic controller is configured to compare the compensated measure of the rate of fluid flow out of the controller to a set value and to adjust the outlet control valve to minimize the difference between the set value and the compensated measure of the rate of fluid flow out of the controller.

7. The mass flow sensor of claim 6 wherein the electronic controller is configured to compensate the controller's sensed inlet flow rate by subtracting from the sensed inlet flow rate the product of: a normalized rate of pressure change within the volume between the sensor bypass and the outlet control valve, a normalized temperature of the fluid within that volume, and the volume between the bypass sensor and the outlet control valve.

8. The mass flow sensor of claim 6 wherein the electronic controller is configured to compensate the controller's sensed inlet flow rate by subtracting from it the product of a constant, the volume between the sensor bypass and the outlet control valve, and the time rate of pressure change within the volume between the sensor bypass and the outlet control valve, divided by the temperature of the fluid within the volume.

9. The mass flow sensor of claim 6 wherein the electronic controller is configured to compensate the controller's sensed inlet flow rate, Qi, by calculating the compensated sensed inlet flow rate, Qo, according to:

$Qo = Qi - C1(V/T)(dP/dt)$, where: Qo = the compensated sensed inlet flow rate, Qi = the sensed inlet flow rate, C1 = a normalizing constant, V = the volume between the sensor bypass and the outlet flow control valve, T = the temperature of the fluid within the volume, and (dP/dt) = time rate of change of pressure within the volume.

10. The mass flow sensor of claim 9 wherein the constant C1 is the resultant of the temperature at standard temperature and pressure divided by the pressure at standard temperature and pressure.

11. A method of determining the outlet flow of fluid from a mass flow controller that includes an outlet control valve, comprising the steps of:

A) sensing and providing an indication of the flow of fluid into the inlet of the controller with a thermal mass flow sensor that includes a sensor bypass;

B) sensing and providing an indication of the fluid pressure in the volume between the thermal mass flow sensor bypass and the control valve;

C) an electronic controller monitoring the indication of pressure sensed in step B) for a period of time to obtain at least two pressure indications; and

D) the electronic controller compensating the indication of flow rate sensed in step A) based on the pressure monitored in step C).

12. The method of claim 11 further comprising the step of:

E) sensing the temperature of fluid within the volume of step B) and providing a signal indicative of the sensed temperature.

13. The method of claim 12 further comprising the step of:

F) the electronic controller employing the temperature signal of step E) in the compensating of the indication of flow rate of step D) .

14. The method of claim 12 wherein the step E) of sensing and providing an indication of the temperature of fluid within the volume comprises the step of:

E1) sensing the temperature of a wall that defines a portion of the volume between the sensor bypass and the outlet control valve.

15. The method of claim 11, wherein the step D) of compensating comprises the step of:

D1) the electronic controller computing the time rate of change of pressure within the volume between the sensor bypass and the outlet control valve, and using the result to produce the compensated measure of the rate of fluid flow out of the controller.

16. The method of claim 11 further comprising the step of:

G) displaying the pressure sensed in step B).

17. The method of claim 16 wherein the step G) of displaying the pressure includes the step of:

G1) displaying the pressure locally.

18. The method of claim 16 wherein the step G) of displaying the pressure includes step of:

G2) displaying the pressure remotely.

19. The method of claim 16 further comprising the steps of the electronic controller:

H) comparing the compensated measure of the rate of fluid flow out of the controller to a set value; and

I) adjusting the outlet control valve to minimize the difference between the set value and the compensated measure of the rate of fluid flow out of the controller.

20. The method of claim 13 wherein the step F) of compensating the controller's indication of sensed inlet flow rate further comprises the step of:

F1) the electronic controller subtracting from the sensed inlet flow rate indication the product of: a normalized rate of pressure change within the volume between the sensor bypass and the outlet control valve, a normalized temperature of the fluid within that volume, and the volume between the bypass sensor and the outlet control valve.

21. The method of claim 13 wherein the step F) of compensating the controller's indication of sensed inlet flow rate further comprises the step of:

F2) the electronic controller subtracting from the sensed inlet flow indication: the product of a constant, the volume between the sensor bypass and the outlet control valve, and the time rate of pressure change within the volume between the sensor bypass and the outlet control valve, divided by the temperature of the fluid within the volume.

22. The method of claim 13 wherein the step F) of compensating the controller's indication of sensed inlet flow rate further comprises the step of:

F3) the electronic controller compensates the controller's sensed inlet flow rate indication, Qi, by calculating the compensated sensed inlet flow rate, Qo, according to: Qo =

Qi - C1(V/T)(dP/dt), where: Qo = the compensated sensed inlet flow rate, Qi = the sensed inlet flow rate, C1 = a normalizing constant, V = the volume between the sensor bypass and the outlet flow control valve, T = the temperature of the fluid within the volume, and (dP/dt) = time rate of change of pressure within the volume.

23. The method of claim 22, wherein the constant C1 is the resultant of the standard temperature (273.15K), divided by the standard pressure, (760 Torr).

24. A mass flow controller comprising:

an outlet control valve;

a thermal mass flow sensor, including a sensor bypass, configured to sense the flow of fluid into the inlet of the controller;

a pressures sensor configured to sense the fluid pressure in the volume between the thermal mass flow sensor bypass and the control valve; and

an electronic controller configured to monitor the pressure sensed by said pressure sensor and to compensate the sensed inlet flow rate sensed by said mass flow sensor to thereby produce a compensated measure of the rate of fluid flow out of the controller, the electronic controller further configured to employ the compensated measure of fluid flow out of the controller to produce a closed loop control signal for the outlet control valve.

25. A mass flow controller according to claim 24 wherein the electronic controller is linked to a plurality of mass flow sensors and outlet control valves and provides closed loop control signals for the plurality of outlet control valves.